Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

dertakes this work must remember, that, while all had much in common, these nations had an independent character, and that their laws, clans, feasts, traditions, and language varied greatly. Morgan's valuable 'League of the Iroquois' was a good account of the modern Senecas. Any one would be misled in applying it strictly to the Onondagas. Each nation, therefore, is worthy of independent study. If some competent person, conveniently near, would undertake this for each reservation, the results would be of great value.

W. M. BEAUCHAMP.

Baldwinsville, N.Y., Nov. 12.

### Species and Subspecies: A Reply to Mr. Conn.

IN *Science* of May 25, 1888 (pp. 253, 254), Mr. H. W. Conn reiterates a belief, held in common by Romanes and himself, that there is a fundamental difference between what he calls 'varieties' and 'species.' The term 'variety' is objectionable on the ground that it is susceptible of several meanings, and consequently may be understood differently by different persons. It may be assumed that the word is used by Mr. Conn in the sense in which naturalists employ the term 'subspecies,' or 'geographical race.'

Mr. Conn says, "There is no question in biology more significant, or more difficult to answer, than what constitutes a species. Upon the answer hinges the question of evolution, and more particularly the theories of Darwin. In spite of an immense amount of discussion, no answer has ever been given to the question which is in any degree satisfactory."

The above statement demonstrates the ignorance of its author in matters well understood by those who handle species, and may be taken as an illustration of the results of the methods of teaching biology now employed in our leading schools, where systematic biology is entirely lost sight of in the effort to impress upon the student the superior importance of morphology, histology, and embryology: in other words, the student is encouraged to turn his back to the broad field of nature, and to open his eyes only to peer into the contracted field of the microscope.

Systematic naturalists — those who have to do with the interrelations of existing forms of life — do not experience the difficulty mentioned by Mr. Conn in defining "what constitutes a species," and are forced to protest against his statement that "no answer has ever been given to the question which is in any degree satisfactory."

A species is a group of individuals which resemble one another in all essential respects, varying only within certain definable limits, and which is separated from all similar groups by a well-marked hiatus. A subspecies or geographical race differs from a species in one respect only; namely, that intergrades exist connecting it with the parent stock: in other words, a subspecies is nothing more nor less than an incipient species.

Mr. Conn holds that 'varieties' are the result of variations in structure outside of the reproductive organs, while 'species' result from changes in the reproductive organs themselves. He says, "Variety and species are therefore independent, being founded on different kinds of variation." This hypothesis, it seems to me, is in its very inception a contradiction of the genius of evolution.

All forms of life inherit two tendencies, — one to reproduce exactly the characteristics of their ancestors, the other to vary therefrom. Variation is the result of one or the other of two sets of causes: namely, (1) the influence of climatic or other physiographic conditions; (2) the accidental or sporadic acquirement of a character which benefits its possessor, and hence is likely to be perpetuated, and increased from generation to generation. In order to clearly understand the laws of evolution, it is necessary to discriminate between these two kinds of variation. In variation resulting from the spontaneous acquirement of a beneficial character, the line of evolution is geographically stationary, but is ascending in time. Natural selection is the cause of this form of evolution; for the excess of individuals resulting from normal reproduction brings about a struggle for existence, and the law of "the survival of the fittest" results in the extermination of the parent form and the successive intermediate stages, so that the modified form and its ancestors are not in existence at any one period of time: in other words, the line of descent must be looked for in the history of the past, among strata containing paleontologic remains. On the other hand, evolution due to geographic position — environmental evolution — may present all intermediate stages at the same time; the extremes, which we call subspecies, being found at distances remote from the centre of distribution of the type. Hence in the study of evolution it must be constantly borne in mind that there is this essential difference between 'geographic variation' and 'variation by natural selection:' that in the one case intergrades exist, in the other case they have become extinct during the process of differentiation.

Variation often takes place in more than one direction, producing several lines of differentiation which radiate from a common centre. In such cases there will be several peripheral forms which may differ from one another more markedly than each differs from the parent or central type.

In environmental variation the intermediate forms which connect the extremes with the central type, or with one another, are termed 'intergrades,' the peripheral forms being recognized as subspecies. The term 'peripheral' is here used in a geographical sense, implying that the individuals showing the peculiarity are found at points remote from the centre of distribution of the type.

It often happens that subspecies differ from one another and from the parent stock as greatly as species themselves. It sometimes happens, also, that in the course of time the forms inhabiting the intermediate region cease to exist, in which case the peripheral forms previously known as subspecies become species at once, without waiting for any further change; the only difference between species and subspecies being, as already stated, that in one case the intergrades exist, in the other they have become extinct.

C. HART MERRIAM.

Washington, D.C., Dec. 1.

### Rosenbusch's Petrography.

YOUR reviewer, in his recent notice in your columns of Mr. Iddings's admirable translation and abridgment of the first volume of Rosenbusch's 'Mikroskopische Physiographie,' seems to me to have hardly apprehended the exact aim of this work. Inasmuch as the review, while not altogether unfair in its statements, may by its general tone convey the impression to those unacquainted with petrography that they are losing in the translation many essential features of the original manual, I beg leave to give the results of my own experience in the practical use of both books for purposes of instruction in a petrographical laboratory.

Heretofore the only available manual for the use of beginners in petrography has been Rosenbusch in the original; and every teacher, even in Germany, must have felt that for this purpose the book is somewhat cumbersome. My own experience has been that the mass of detail, however advantageous and necessary to the advanced worker, caused a loss of interest to students who were beginning the subject, even when they belonged to a superior class and possessed a tolerable knowledge of German. Those who, from an intimate acquaintance with Professor Rosenbusch's treatise, realized its great value, were loath to recommend even to beginners any other guide; and yet the need has long been felt of a translation which should present all the essential features of the work in English, without the mass of detail unnecessary for those taking their first steps in petrography. This need the translator has set before himself to fill, and in my opinion he has accomplished the task in a most judicious and satisfactory manner. Since the appearance of his translation a few weeks since, I have used it in my laboratory with a success which I had begun to despair of ever attaining with the original. Nothing really essential has been omitted, while the book has been reduced to nearly half its former size. The colored plate could be of no practical use to beginners, but would have increased the price of the work very considerably.

In his own preface the translator states that he has had no expectation or desire to supplant the use of the original. No student would dare to venture upon original investigation in petrography without a knowledge of German sufficient to enable him to read with ease the work in its extended form. To advanced workers Rosenbusch will be now, as ever, a vast treasure-house of information, which no abridgment of the translation will in any way curtail.

GEORGE H. WILLIAMS.

Baltimore, Nov. 30.